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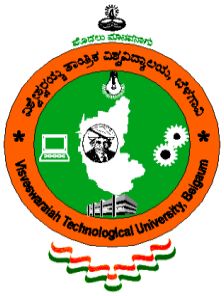

PROJECT REPORT

"ULTRASONIC ASSISTED BIODIESEL PRODUCTION FROM WASTE COOKING OIL AND STUDY OF PERFORMANCE CHARACTERISTICS IN A SINGLE CYLINDER DIESEL ENGINE"

(Sponsored by Karnataka State Biofuel Development Board and KSCST Bangalore)

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ABSTRACT

The invention of internal combustion engine and subsequent developments in engine technology has led to wide spread exploitation of the petroleum reserves, which are being depleted at a rapid rate. Moreover, the combustion of these fuels has polluted the environment. Fuel crisis because of dramatic increase in vehicular population and environmental concerns have renewed interest of scientific community to look for alternative fuels of bio-origin such as vegetable oils.

Direct use of vegetable oils as IC engine fuel leads to several problems. Thus vegetable oils must be subjected to chemical reaction such as transesterification to reduce the viscosity of oils. The transesterification reaction in mechanical stirring method can occur only in the interfacial region between the oil and alcohols which are totally immiscible; this is a very slow process. A vigorous mixing is required to increase the area of contact between the two immiscible phases, and thus produce an emulsion. Ultrasonic probe type reactor is one of the alternative methods to high mixing. The key benefit to this probe reactor system is the possibility to make batch production.

In this project biodiesel has been produced from waste cooking oil (various hours of abused oils) by two different methods using NaOH as catalyst and its performance testing is done in compression ignition engine. Biodiesel sample has been prepared by ultrasonic assisted technique (UT) and magnetic stirrer (MS) method and comparison has been made between the two methods. Specific to this work, thermal affects of ultrasonics in transesterification reaction along with effects of ultrasonic energy intensities was reported. The transesterification reaction can be completed in very shorter reaction time as much as 30min even without any temperature control settings. Out of three different amplitudes (12µm, 30µm, 48µm), 48µm (40%) worked best for transesterification reaction. The performances of biodiesel blends B20 MS (magnetic stirrer) and B20 UT (ultrasonic technique) have been checked by the performance parameters like brake power, brake thermal efficiency and specific fuel consumption and emission characteristics. Tests are carried out at constant speed of 1500 rev/min at different engine loads. Results showed that brake thermal efficiency of B20 UT blend was marginally higher as compared to B20 MS and diesel. Emissions of carbon monoxide, hydrocarbons are reduced and slightly higher NO_x in case of B20 UT compared to B20 MS and diesel. Based on this study, it can be concluded that WCO biodiesel produced by ultrasonic assisted technique (UT) may be used a substitute for diesel in diesel engine at B20 blend.

Key words: Biodiesel, WCO, ultrasonic reactor, engine performance.